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PRELIMINARY REPORT OF THE ARITHMETIC COMMITTEE.

To the Association of Teachers of Mathematics in the Middle States and Maryland:

When the arithmetic committee was appointed, its work was outlined as follows:

"(1) To give a careful and detailed statement of the objects and aims in teaching arithmetic. These objects should be expressed in specific and not in general terms. (2) To consider how these objects are best attained. Experiments of value so far as possible should be employed."

Your committee during the past five months has been occupied in considering the first of these instructions, namely, the objects and aims in teaching arithmetic. So far as the introductory work is concerned, the object or aim is clear, therefore arithmetic in grades I. to IV., according to the common arrangement, has been eliminated from our study. Difference of opinion, however, arises as soon as the foundation work is completed. Therefore the committee has confined its inquiry to the consideration of the prime reason for teaching arithmetic after the elementary operations with integers and fractions have been mastered.

A questionnaire was prepared and sent to fifty-five persons, including experts in the fields of psychology, pedagogy, and mathematics. Twenty-five replies were received which have been summarized as follows:

Synopsis of Replies to Question I.

I. What is the prime reason for teaching arithmetic in grades V. to VIII. as our schools are generally organized?

To master and give exactness and speed to the fundamental operations taught below the 5th grade—and to show how these operations may be applied to problems of daily life, both of civic and local interest.

To acquaint them with the quantitative side of large industries and other phases of social life, such as insurance, banking, etc.

Robt. J. Aley, President, University of Maine.
A. B. Poland, Superintendent, Newark, N. J.
E. L. Thorndike, Teachers College, New York City.
W. W. Hart, University of Wisconsin, Madison, Wis.
D. E. Smith, Teachers College.
F. M. McMurray, Teachers College.
A. H. Huntington, Central High School, St. Louis, Mo.
H. E. Slaught, University of Chicago.

To strengthen one's understanding and appreciation of the activities of the business world by the study of denominate numbers, interest, partnership, taxation, stocks and bonds, and similar topics, as it is equally important for the pupil to have an understanding of the business environment as of the natural environment—practically essential in the equipment for life work of every individual.

Julius Sachs, Teachers College, New York City.
F. E. Downes, Superintendent, Harrisburg, Pa.
W. C. Bagley, University of Illinois, Urbana, Ill.
D. E. Smith, Teachers College.
David Felmley, Normal, Ill.
Joseph V. Collins, State Normal School, Stevens Point, Wis.

For those who go to high school and college, algebra and geometry should begin with the seventh grade.

For pupils not going to the high school, there should be a course (in the 7th and 8th grades) in elementary economics and sociology,—buying and selling of goods, insurance, taxes, partnership, etc.

Henry Suzzallo, Teachers College.

To render conscious all those mental factors and activities, control of which gives an individual the power to attack with confidence and with more than average success any problem in any field that it may be necessary for him to attack; in other words, which give him general ability.

There is no question of transfer of specific training here. Experiments have proved that specific training transfers little if at all, even in the same field. But specific training may generate ideas, or ideals whose influence will transfer to every field. Mathematics should make conscious those ideals whose influence is most far reaching in their effects upon reasoning in any field.

S. A. Courtis, Detroit, Mich.

To learn when to add, subtract, multiply, and divide in problematic situations calling for two or more of these processes; to learn the rudiments of mathematical thinking; to acquire a regard for, and the habit of neatness, orderliness and precision; and to learn a little of the connectedness and unity of arithmetical subjects,—not the theoretical ones, not the non-essential ones, not the complex ones.

G. W. Myers, University of Chicago, Chicago.
E. P. Sisson, Colgate Academy, Hamilton, N. Y.

To develop and strengthen the reasoning powers of our girls and boys and thus give them the ability to reach safer and sounder conclusions in their affairs in life,—the disciplinary value.

E. P. Sisson, Hamilton, N. Y.
Albert H. Huntington, Central High School, St. Louis, Mo.
W. H. Metzler, Syracuse University, Syracuse, N. Y.

In order that people may measure mass, time, energy, space, and value; to adjust means to ends in the practical affairs of life.

David Felmley, Normal, Ill.

To insure, through proper drill, a complete and permanent mastery of simple operations with integers, common fractions, and simple decimals; also simple operations with percentage and simple tables of measurement, together with the beginning concepts of algebra and the elementary geometrical relations.

Edward O. Elliot, University of Wisconsin, Madison.
F. E. Downes, Superintendent, Harrisburg, Pa.

To cultivate general mental alertness.

H. E. Slaught, University of Chicago.

SYNOPSIS OF REPLIES TO QUESTION II.

II. What is the greatest need for reform, if we are to accomplish this result?

(*a*) Wise selection of material.
(*b*) Elimination of all unpractical problems.
(*c*) Raising the standard of attainment of pupils.

Joseph V. Collins, State Normal School, Stevens Point, Wis.

There is need for a reduction in the topics suggested by the text-books and a general simplification of method. The teachers above all ought to acquire a mastery of every subject which will make them independent of the text-book. Applied arithmetic, that is to say, such arithmetic as actually and generally occurs in the lives of our pupils, ought to be the standard for the work set. Unduly complex problems are useless and absurd. It would then be possible to introduce many practical questions in mensuration, a combination of drawing and simple calculation of space and volume contents could be combined with the arithmetic.

Julius Sachs, Teachers College, New York City.

To make a sharp differentiation at the close of the sixth year, aiming to complete the formal fundamental work within the first six years, and to make the purpose, content and method of instruction of the seventh and eighth years vastly different.

Henry Suzzallo, Teachers College, New York City.

The elimination of the useless and antiquated material from the arithmetic is the first step necessary to a better program. The introduction of present day material and the adjustment of this material to present business practice is the second step. The third step is the better preparation of teachers by the normal schools.

R. J. Aley, President, University of Maine.

Ellwood P. Cubberley, Leland Stanford University, California.

The greatest need for reform is to close the elementary work at the end of the 6th grade and begin the high school work with grade seven.

David Eugene Smith, Teachers College, New York City.

Make the teaching as practical as possible, insist on clear analysis, full comprehension. The work should not drop into mere mechanical routine or memory exercise.

J. G. Estill, Hotchkiss School, Lakeville, Conn.

A. B. Poland, Superintendent, Newark, N. J.

More arithmetic of the mental type.

W. H. Metzler, Syracuse University.

H. E. Slaught, University of Chicago.

Simplification and humanizing of the example material, making it more nearly the sort met in actual daily life.

Walter W. Hart, University of Wisconsin.

H. E. Slaught, University of Chicago.

The specific answer to this question is that the course of study should be reorganized on the basis of the fundamental aim. Efficient teaching of fundamental abilities needed for social service must come before everything else. Simplification of the course of study, quantitative measurement of the powers and capabilities of the growing child, and of the effects of teaching effort, together with experimental determination of efficient methods, is my program. The higher aims will become clear as the lower training becomes more specific and efficient.

S. A. Courtis, Detroit, Mich.

Scarcity of teachers who know enough arithmetic and of real scientific method to teach the subject even fairly well; and scarcity of scientific texts together with the general failure to choose texts in arithmetic with an eye single to educational interests.

G. W. Myers, University of Chicago.

The main means by which this can be accomplished is to make a study of such topics on the quantitative side and teach the facts through series of problems; each of whose answers is worth finding out and which together tell a story.

F. M. McMurray, Teachers College, New York City.

Teachers that have a broader and deeper knowledge of arithmetical number and its application to the problems of life.

Teachers who will teach the subject rather than a book, and who use the book as a means to an end. I would have arithmetic taught but three years in our grades and one year in the high school.

E. P. Sisson, Hamilton, New York.

The greatest needs seem to me to be a scientific study of just what is now accomplished in the last four grades, a study of the uses to which arithmetic is actually put by the pupils who attend these four grades and the organization of subject matter and methods of teaching unhampered by tradition.

Edward L. Thorndike, Teachers College, New York City.

Lead teachers to see that what we may call the computation element of the so-called arithmetic of the upper grades is secondary, that the primary purpose of the teacher is to acquaint the children with a great variety of human affairs to which arithmetic is applied. Many of these affairs will be somewhat remote from the life of many of the pupils, but there is a great body of common knowledge that everybody needs connected with areas and volumes, specific gravity and business life that all should be taught.

David Felmley, Normal, Illinois.

Eliminate all subjects of doubtful or little " knowledge " value, especially those having little "incidental" value,—such as many odd and unnecessary rules of measurements involving and requiring memory only, Duties and Customs, Annual Interest, Partial Payments, Stocks and Bonds, Domestic and Foreign Exchange. Teach those subjects with greatest intensity that bear more directly upon the incidental results to be accomplished. Bear especially upon subjects that may be regarded as preliminary to the study of algebra and geometry, such as Involution, Evolution, Ratio and Proportion, and teach them so far as feasible with a view to paving the way to this more advanced work. Bear hard upon subjects most common in special business relations. Make problems practical and related to the industrial and commercial life of the community.

F. E. Downes, Superintendent, Harrisburg, Pa.

Reform ought to bring about exactness and habitually accurate thinking.

A. H. Huntington, Central High School, St. Louis, Mo.

The replies are suggestive of the trend of thought on arithmetic teaching in the upper grades. The committee feels that it is not at present justified in making final recommendations to the Association. The reports of the International Commissioners on the Teaching of Mathematics will soon be completed. These reports, together with other comparative studies with which the committee is in touch, should be consulted before any final recommendations are proposed.

The committee therefore suggests that this preliminary report, including the summarized replies to the recent questionnaire, be published in the MATHEMATICS TEACHER for the information of the Association.

Respectfully submitted,

JONATHAN T. RORER, William Penn High School, Philadelphia, Pa., chairman,

M. J. BABB, University of Pennsylvania, Philadelphia, Pa.,

J. C. BROWN, Horace Mann School, Teachers College, New York City,

A. M. CURTIS, Normal School, Oneonta, N. Y.,

CHARLES C. GROVE, Columbia University, New York City,

EMMA WOLFENDEN, William Penn High School, Philadelphia, Pa.,

Committee.

PHILADELPHIA, November 30, 1912.